"Innovation in a Changing World"
STATE OF THE INSTITUTE ADDRESS
Georgia Tech President G. Wayne Clough
Faculty/Alumni, October 14, 2004

(TITLE SLIDE)
It is my pleasure to present to you the 2004 State of the Institute Address. As usual, we have gathered some of the highlights of the past year in a little brochure, and I hope you will take time to read it. It is a supplement to my talk today, and covers much more than I will have time for.

The title of this year's State of the Institute Address is "Innovation in a Changing World," a topic I feel is particularly relevant to Georgia Tech. Because of the growing importance of technology in the world, we are uniquely positioned to shape the future through the outcomes of our research and by graduating the next generation of technological leaders. But we will only reach our true potential if we anticipate the issues that lie ahead and guide our efforts accordingly. Let me put this in context for our nation first and then speak to what it means for Georgia Tech in particular.

(SLIDE: 20 YEARS AGO)
Predicting the future is an inexact science at best. Looking back is one way to anticipate what might lie ahead, so for purposes of these remarks, let's look back twenty years and work our way forward. Much of the technology we use daily and take for granted did not exist twenty years ago. Computers had no hard drives. The only way to save your work was on a five- and-a-quarter inch floppy disk. There were no cell phones, let alone phones with text messaging capabilities or built-in digital cameras. In fact, there were no digital cameras. There was no dot-com economy to boom or to bust, because there was no commercial Internet.

There were also no terrorist threats in our nation in those days. The Berlin Wall was still standing, and the world was shaped by two dominate political power blocks – the communist world of the East, anchored by the Soviet Union, and the democratic world of the West, anchored by the United States.

(SLIDE: POWERFUL TRENDS)
With the end of the Cold War, the Soviet Union broke into its component republics in late 1991, and the political barriers that had separated the world rapidly dissolved. The European Union was created and trade barriers between many nations came down. Proliferation of telecommunications technology and the Internet opened up new avenues of inexpensive, real-time communication. Emerging nations like India, and

China began developing economies that competed more directly with ours, including making investments in higher education – something I'll come back to in a minute. The 1990's and early years of this new century saw the dot com economy come in like a lion and go out like a lamb, and our nation was attacked by terrorists, leading to wars in Afghanistan and Iraq, the consequences of which are still playing out.

It is apparent a lot can happen in twenty years. Bearing this in mind, let's think ahead to the year 2020. Over the past few years I have been chairing an initiative of the National Engineering Academy called the Engineer of 2020, and working with futurists and a large group of thoughtful people, we have been trying to imagine what the world will be like in two decades. The conclusions are relevant to the issues I will address in my remarks today.

(SLIDE: WORLD OF 2020)

While we know about the perils of trying to predict the future exactly, there are some things that we can expect with a reasonable level of confidence. First, there will be a lot more people living on Planet Earth, probably upwards of two billion more. There will also be some shifts in who they are and where they are. By 2020, more of the world's population will be in cities rather than rural areas, producing greater challenges to fill the needs for urban infrastructure. And by 2020, if the world's population were to be seen as consisting of 100 people, it is estimated that 56 of these will live in Asia, 16 in Africa, and only 4 in the US.

(SLIDE: PROBLEMS, OPPORTUNITIES)

Emerging population demographics like these are already bringing into focus many of the potential issues of the future. The pressure of an increasing world population on the natural environment will accelerate global warming and create water shortages. Between one-half and two-thirds of the world's population is expected to experience water shortages by 2020. A surge in the economies of India, China and other nations will place considerable pressure on resources we have taken for granted like building materials and carbon based fuels. These nations, as well as Russia and the European Union, are also all seeking to compete with the U.S. in the technological economic sector and are making inroads. Some of this is accentuated by disparities in wages between the U.S. and China and India, but it is also driven by the growing size of the skilled technological workforce in these nations. It is estimated by the National Science Foundation that China, India, and the EU each already graduate more engineers than does the U.S.

(SLIDE: OPPORTUNITIES)
Fortunately, there is a flip side to this equation in the form of opportunities that will arise for those who are prepared and plan for the realities of the future. Impending breakthroughs in areas like biotechnology, nanotechnology, telecommunications, logistics and sustainable technology will open new fields of endeavor and change the way we live our lives.

(SLIDE: SCALESE QUOTE)
But just discovering new technology will not be enough in this new, inter-connected global economy. To win in the competitive marketplace of the 21st century, our solutions must offer value that makes them worth the cost. Our competitive edge will lie in the leading-edge of technological developments. Our competitive edge will be in applying technology in creative ways to solve the problems and serve the needs of society, and in shaping public policies that that enable this process.

(SLIDE: INNOVATION QUOTE)
In short, our competitive edge should be based on innovation. "Innovation" has become a buzzword often used interchangeably with the word "invention," but they are not the same thing. Invention can be done by the lone genius tinkering away in the garage or the garret. Innovation is a much more social activity that emerges at the intersection of technology with business and with the marketplace.

Innovation requires that we not only discover new knowledge and technology, but also that we also anticipate ways to put it to work within a complex legal, political, social, and economic landscape. At its most fundamental level, innovation done right will lead to new products, new companies, and maintain a high standard of living for the United States.

(SLIDE: MORSE, BELL)
We can see this notion epitomized in our history when we think back to the invention of the telegraph and telephone in the 19th century. Samuel Morse and Alexander Graham Bell were the stereotypical inventors, working away in their labs on a piece of technology, but their inventions became innovations that spawned today's enormous telecommunications industry and changed the very character of our lives and our work.

Last February, the National Innovation Initiative, which I am privileged to co-chair with IBM CEO Sam Palmisano, was launched right here at Georgia Tech. In our recent interim report, we identified five characteristics of innovation, and the telegraph and telephone meet them all. They were global phenomena whose impact still continues to be felt around the world. They were interdisciplinary, emerging at the intersection of

different fields of research and spheres of activity. They sparked other inventions, and those inventions in turn played off of each other, becoming a transformational force around the world.

(SLIDE: WORLD LEADERS QUOTE)
What will be the equivalent inventions for our century? What inventions in biotechnology or nanotechnology will become the key transformational innovations that spin off dozens of new products and change life as we know it down through the coming decades? And, more to the point, who will be in a position to drive that change?

The goal of the National Innovation Initiative is to move beyond talking and actually do something – to promote an action agenda that harnesses the factors and dynamics to insure the United States remains at the forefront of the innovation space.

(SLIDE: STRATEGIC PLAN QUOTE)
That is our aspiration at Georgia Tech as well – to deliberately position ourselves to be a leader in innovation. Our goal is to define the technological university of the 21st century. That in itself will be an innovation that transforms other universities around the world. This afternoon I want to focus on the steps we are taking towards that goal, and some of the issues that cause pause for concern.

(SLIDE: TRADITIONS)
In many ways, life at Georgia Tech is defined by tradition. The Whistle has blown at five minutes before the hour for more than a century. Successive generations of students have preserved the Ramblin' Wreck in pristine condition. Freshmen still get Rat caps, and are still writing football scores on them.

(SLIDE: ADD "LEADING EDGE")
But among Georgia Tech's most prominent and enduring traditions are a "can-do" culture of entrepreneurism and a knack for creative problem-solving. We have endured over time because we have built on these traditions, and shown a will to adapt our approaches as change dictated the need. Today, perhaps as never before in our history, the pace of change and the emergence of competition for the technology-based economic space, calls for us to use our strengths in a way that anticipates the future, not simply responds to it after it has arrived. It calls for us to establish longer term planning horizons so we can be at the vanguard of those who lead change.

(SLIDE: ERODING STATE FUNDS)
Our high aspirations require financial resources that allow us to meet the competition. However, the state of Georgia is presently facing a tight revenue picture, and we have

seen the results in the form of a series of reductions in the state allocations to Georgia Tech, amounting to a total of $51 million. Today, we are operating with an allocation from the state that equals what we received three years ago, back in 2001, but we have 1,250 more students. Even so, Georgia Tech has never been deterred by a short-term lapse in state funding, and we have consistently shown our resilience in raising non-state funding to help fill the gap.

(SLIDE: GRAPH: SHORTFALL)
Today, the state provides only 25 percent of our total budget, down from 34 percent ten years ago. Over the past ten years, Georgia Tech funded over 80 percent of its capital construction needs, and today the Institute pays for the salaries for over half of its faculty and research staff with non-state funds. We have streamlined our processes and reduced employee levels, even though our enrollment is at a record level. When it is suggested by some, "do more with less," I say come on down to our campus and see what our faculty and staff are doing. Come on down and see what our friends and alumni are doing to allow Georgia Tech to keep this state competitive in a new economic order. Our track record speaks for itself.

The question is, "Where is the balance point, and where are we headed?" We can deal with a lot of issues if given time to address them. I believe it is time for a statewide policy discussion about how public higher education will be funded in Georgia, particularly in view of the challenges that lie ahead. In the future, Atlanta and Georgia must be ready to compete for technology industry not with adjacent states, but with Shanghai, Bangalore and Moscow. To do any less is to cede the best jobs to others who are making the decisions that are needed.

(SLIDE: OUTSTANDING PEOPLE)
When it comes to using innovation to turn challenges into opportunities, we rely on the people equation. Georgia Tech is a community of 22,000 people – about 16,800 students plus 5,000 faculty and staff. This is a remarkable group of talented people who provide one of our competitive advantages.

(SLIDE: FRESHMEN)
The process begins with admitting one of the smartest, most well-rounded freshman classes of any public university in the United States. This year's class is a little bigger than the past few years, mostly because more students than we expected accepted our invitation to enroll at Georgia Tech. But even as the class got a little bigger, it also got a little smarter, registering the highest average SAT score of any freshman class in our history. And it is also the most diverse class we have ever admitted, with more women, minorities, and international students than any prior class.

(SLIDE: STUDENTS SHINE)
Our students do not stop achieving after they get here. At the other end of the pipeline, our graduating seniors are winning some of the most prestigious scholarships and fellowships in the world. Blair Dowling is now at Princeton, beginning work on a Ph.D. Laurence Ralph, who won the Georgia Tech's first major fellowship in the humanities, is at the University of Chicago. Gabe Brostow is one of only two Americans to receive this fellowship and is at Cambridge University doing post-doctoral research. Monique Gupta is also at Cambridge. And Jia Xu is at the London School of Economics and also plans to attend Imperial College.

(SLIDE: SOLVING PROBLEMS)
Our nation is in serious need of technological leaders of the type I have just described, and Georgia Tech is one of the few places that can provide them. Given the qualifications of our incoming freshmen, we need to challenge them with a rigorous curriculum and teach them leadership and problem solving skills. And at the same time we also need to give them every opportunity to succeed.

(SLIDE: UNDERGRAD)
Here the Institute has shown its flair as a place of innovation. No other technological university offers such a robust array of programs and activities for its students to grow as human beings and begin to learn leadership skills. Here you see a number of our recent initiatives that undergraduates have embraced with enthusiasm. Consider our study abroad programs, which now rank among the top in the nation in terms of numbers of students participating.

(SLIDE: SA GRAPH)
As Georgia Tech has expanded opportunities for its students to study abroad, students have responded. After a slight dip in reaction to the terrorist attacks and SARS, the number of Study Abroad students increased by 14 percent last year. By the time our students graduate, about one-third of them have participated in an international education program at some point in their undergraduate careers.

In addition to giving students a chance to experience another culture, a number of programs offer them an opportunity to tackle serious problems. One group of faculty and students from Civil and Environmental Engineering traveled to Angola to survey and provide advice on the immense infrastructure and environmental problems caused by 30 years of war. Another group of 13 graduate students and three professors from Tech's City and Regional Planning Program in the College of Architecture went to Ecuador, to discuss and offer advice on the problem of urban sprawl. Sharing our

knowledge to help others achieve their hopes is a mark that differentiates Georgia Tech from the typical technological university.

(SLIDE: CROSS-DISCIPLINARY)
As I have noted, an important aspect of innovation is that it is interdisciplinary, and we have worked hard to develop this as a central characteristic of Georgia Tech's personality. As technology becomes increasingly ubiquitous, demand is growing for scientists and engineers who understand the broader social and cultural ramifications of their work and for practitioners in a wide range of other disciplines who understand technology.

(SLIDE: INNOVATIVE PROGRAMS)
We also excel in running against the academic grain by creating spaces between the disciplines where people and ideas can thrive. The Ivan Allen College has taken advantage of our interdisciplinary climate to create the McEver Program for Engineering and the Liberal Arts. A recent McEver seminar examined the intersection of engineering and the arts in the human body. Here you can see the Goliard Music Ensemble, which spent an evening with the seminar group exploring the use of technology in the form of musical instruments to create artistic expression and meaning.

Over the past five years, the School of Modern Languages created 61 new courses, many of them team-taught; launched two interdisciplinary degrees; and developed an innovative international internship program. And we were proud to have their accomplishments recognized by the Board of Regents.

TI:GER stands for Technological Innovation: Generating Economic Results. This program, based in the College of Management, is both an interdisciplinary and an inter-university endeavor. It brings together students in management, law, science, and engineering from Georgia Tech and Emory University to study the challenges of commercializing new technologies and marketing innovative products.

(SLIDE: PROFESSIONAL)
Georgia Tech is also a leader in creating interdisciplinary professional master's degree programs, which are encouraged by several national organizations as a way to strengthen America's scientific workforce and broaden the appeal of science and technology to students who are not interested in academic careers. We now have four of these degree programs and lead the nation in this effort. These very successful degree programs are models for other universities around the nation who are trying to get some interdisciplinary degree programs going.

(SLIDE: INNOVATIVE)
Teamwork is an important skill in an interconnected, interdisciplinary world, and we win accolades for our leadership in this space. The Georgia Tech and Emory students who competed in the Idea-to-Product competition are from TI:GER and were recognized by Stanford University with a top award. The Campus MovieFest is the world's largest student film festival for which student teams are provided with equipment and produce a five-minute film within a short timeframe. And ARCHITech is a design program for middle-school kids created by graduate students in the College of Architecture

(SLIDE: EXCELLING)
This flair for students who excel outside the classroom is nowhere better illustrated than by our remarkable student-athletes. Our men's basketball team was projected to finish seventh among the nine ACC teams, but instead became the first team from Georgia to play in the NCAA Division I-A Championship Game. The women's volleyball team was the first ACC team to make it to the Elite Eight in the NCAA tournament. The golf team finished in the top five for the fourth time in the past five years. In all, 15 of our 17 Division I-A teams qualified for post-season play.

But at the same time the basketball team was making its amazing run through the brackets, five of its members were making the Dean's List for spring semester. After every game, coach Paul Hewitt would remind his players of exactly how many days of class they had missed, and he expected all of them to have their textbooks out on the bus on the way home. All together 45 percent of Tech's student-athletes are on the Dean's List.

(SLIDE: CLUBS)
Georgia Tech fields only seventeen NCAA Division I-A teams, but that does not stop our creative students from competing with the best in the nation in any number of other sports. Despite having no scholarships or paid coaches, a number of Tech club teams compete against the best schools in the nation and come away winners. They demonstrate the discipline and determination that are characteristic of Georgia Tech students.

(SLIDE: FACULTY HONORED)
Our faculty are as outstanding as our students, and you can see in the brochure that they win a long list of awards and recognitions every year. Here are just a few of the most prestigious awards they received during the past year. Our young faculty are equally outstanding, winning 13 National Science Foundation CAREER Awards over the past year. This brings the cumulative total of CAREER Awards won by Georgia

Tech faculty to 96 – second highest in the nation. The PECASE Award is presented by President Bush and is relatively new. Julia Kubanek's is the fifth for Georgia Tech.

(SLIDE: RANKINGS)
Our outstanding students and faculty are the primary reason Georgia Tech has been ranked among the nation's top ten public universities every year since 1999. Engineering remains among the top five programs in the nation, and we are beginning to see the payoff from the patient work done to strengthen our other colleges. I am proud to be able to say that today essentially all of our programs at Georgia Tech from business, science, architecture, and computer science are all ranked in the top ten percent of their disciplines. And if you want to see a demonstration of our willingness to take a risk and offer a new direction for our students, look no further than our unique joint biomedical engineering department with Emory, which this year leap-frogged the competition to arrive at second place in the rankings in record time.

(SLIDE: 4 CAMPUSES)
Of course, the point of our endeavors is not merely to be admired, but to define the technological research university of the 21st century and to be recognized as a leader. Innovation is global in nature, and as the world becomes more open and interconnected, opportunities are increasing for Georgia Tech to offer innovative solutions. As a result, we are stretching our learning environment to reach around the globe.

For starters, we have our own research and education platforms in Metz, France, and Singapore as well as a campus in Savannah. The international campuses began as graduate programs in engineering, but they are in the process of expanding. They are unique in offering students dual degrees with other prominent local universities and allowing their students the opportunity to come to Georgia Tech to finish their degrees. This past year more than 100 students from France walked across the stage to receive a Georgia Tech degree.

(SLIDE: RESEARCH)
The discovery of new ideas and the invention of new technology is the foundation for the innovation process. And these days the frontiers of research are located in the spaces between the traditional academic disciplines.

(SLIDE: THRUSTS)
So Georgia Tech's research is as cutting edge as our educational programs. The Institute's major science and technology research thrusts, listed on this slide, represent areas of importance to the future whose context is framed by the input of a range of

different disciplines. And we are not just talking about technological mixes, but those that add public policy, international affairs, entrepreneurship, marketing, and transportation systems – all of which are required to bring the new ideas and inventions to fruition. We are creating a fertile environment for generating some of the transformational innovations of the 21st century.

(SLIDE: SHUMING NIE)
Nanotechnology will literally touch every aspect of technology as it becomes more full-blown. Georgia Tech is applying its expertise in this new field to a wide range of disciplines from biomedical engineering to textiles to chemistry. Professor Shuming Nie, for example, has been developing nanoparticles called quantum dots that attach themselves to cancer cells and give off a fluorescent glow, so that body-scanning technology can do a better job of early identification of cancer. His work, and that of his colleagues, is attracting attention and just last week received $10 million in funding that puts Georgia Tech and its partner Emory at the forefront of the nation in terms of nanomedicine grants.

(SLIDE: GRAPH)
This ability to collaborate across disciplinary lines is a major factor in the strong and continuing growth in research awards and expenditures that Georgia Tech has experienced over the course of the past decade. We are among the nation's top 35 research universities, and if you take out the ones that have medical schools, we are among the top five of these that remain.

(SLIDE: MILESTONES)
As you can see, the milestones of the past year are impressive and our investments have opened new areas of opportunity. The biggest source of university research funding in the nation is the National Institutes of Health, and the $10 million grant I mentioned a moment ago is evidence of the great strides we are making in tapping into this funding source. Our 115 interdisciplinary centers and their $108 million in research activity is proof that we do more than pay lip service to interdisciplinary interaction.

Finally, we recently celebrated the grand opening of the Ovarian Cancer Institute on our campus. It was a touching moment for those who were there, as women who are fighting this silent and often-fatal disease told their emotional stories. Georgia Tech's research does not often bring us face-to-face with the people it serves, but the Ovarian Cancer Institute is one of those special places of close personal contact, and it humanizes our endeavors.

(SLIDE: EC DEV)
Research discoveries and technology inventions do not become innovations until they are put to work in the commercial marketplace to improve our lives. This is where Georgia Tech's life-long focus on driving economic development gives us an advantage over many of our counterparts. This will remain true well into the future because we appreciate that an innovative approach to commercialization is not the same as the old approach to economic development.

(SLIDE: VENTURE LAB)
Consider our new concept, VentureLab, which is designed to identify ideas and technology from Georgia Tech labs that have market potential and to help faculty and students through the early stages of commercial development. VentureLab is a one-stop shop for faculty and student who want to commercialize their ideas. And it does not just wait for something good to happen, because VentureLab professionals work directly with our faculty and students to provide early identification of ideas that should be moved from the lab to the marketplace. VentureLab helped Biomedical Engineering Professor Barbara Boyan attract venture capital funding for Orthonics, Inc., a new company that will commercialize spinal disc repair technology from her lab.

(SLIDE: ADD ATDC)
Many of VentureLab's most promising prospects go into incubation at the Advanced Technology Development Center, the Tech-run high-tech business incubator. Here fledgling technology companies get the help they need to survive the launching stage. This past year I was proud to represent ATDC and Georgia Tech in accepting the top national award for best incubator from the U.S. Department of Commerce.

(SLIDE: PARTNERSHIPS)
Another characteristic of innovation is promoting openness and interaction, and Georgia Tech's collaborative relationships stretch beyond our campus borders, reaching across town and around the world. Our most fully developed partnership is with our in-town neighbor, Emory University. To our knowledge, the Coulter School of Biomedical Engineering is the only public-private academic partnership of its kind in the nation, and it represents only one of several important ways in which we work with Emory.

(SLIDE: GLCC)
Our international partnerships are growing as well. I have already mentioned our campuses in France and Singapore, and the local governments there are our partners in place of the state of Georgia. The new Global Learning and Conference Center at Technology Square gives us a new window on international partnerships by helping

create long-distance programs. This fall we began a distance learning master's degree program for GE employees at their Welch Technology Center in Bangalore, India. We also have many other international relationships with universities ranging from the Technical University of Munich to Imperial College in London. We are working with a consortium of Israeli universities that are looking to us for help in developing expertise in nanotechnology, and we are actively working with two universities in China towards establishing working relationships that will benefit them and us.

(SLIDE: PLACES)
Our innovations do not stop with our research and programs. They extend to the development of a beautiful, sustainable campus and the growth of new facilities. Integral to all of our new projects is the principle of sustainability, including green space, the use of energy-efficient systems, and new concepts to capture and reuse rainwater and run-off.

(SLIDE: INNOVATIVE FACILITIES)
The Biotechnology Complex is a unique complex of academic and research neighborhoods that forms the academic heart of campus and has attracted international attention. And the fourth structure – the Molecular Science and Engineering Building – will be under construction early next year. Across the street, the Information and Telecommunications Technology Complex will help Georgia Tech to gather and coordinate its programs in this important area. A key component is the Klaus Advanced Computing Building, which is under construction as we speak.

Technology Square is an innovative development on many levels, not only gathering our business education and service programs in one location in the heart of Midtown Atlanta's growing high-tech neighborhood, but also providing that "university village" setting of retail shops and restaurants that our campus has lacked for so long. To date, it has won twelve regional and national awards, and more are yet to come.

(SLIDE: CRC)
Add in the newly opened Campus Recreation Center and the Stamps Student Center Commons, and you can see a significant improvement in the facilities that support campus life. Confirmation that these facilities meet an important need can be found in the hundreds of students who use them daily.

(SLIDE: 5TH ST BRIDGE)
Occasionally innovation can even make a silk purse from a sow's ear. The 5th Street Bridge that connects the main part of campus to Technology Square is presently one of our biggest eyesores. But, using a plan developed with Georgia Tech, the Department of

Transportation is going to transform that bridge so that going to Technology Square will become a walk in the park. They will do half of the bridge at a time so that the bridge can stay open. That will take longer, but the result will be worth the wait. It represents yet another example of expanding our innovative thinking, from our workplace activities to those that affect our lives visually and aesthetically.

(SLIDE: CONCLUSION)

As you can see, Georgia Tech faces both challenges and opportunities. We are challenged by the need to maintain excellence in the face of uncertain state resources. We are challenged by competition from many other universities who also want to be the best, and some of them have been up there in the top tier much longer than we have. But we have the advantage of outstanding people and a heritage of creative problem-solving and a "can-do" entrepreneurial spirit. We also have made the decision to update this model and adapt it to a new global environment where competition will be sharp and there will be no room for those with a timid spirit.

Our quest to define the technological university of the 21st century is an expression of our intent to help drive the innovation of the future. Our nation needs what we can provide, and we at Georgia Tech are becoming known for innovation because we have talented leaders who know and understand how to span disciplines and identify the problems with the largest potential impact. And in the process, we will help our nation to compete, and shape a healthier, more sustainable, and more prosperous future for all of the inhabitants of this world of ours.